

Quantitative Analysis of Essential Oils

Essential oil:

Essential oils (Volatile oils) are products generally of rather complex composition, comprising the volatile principles contained in the plants, and more or less are modified during the preparation process.

Essential oils are found as compounds including;

- Terpenoids
- Aromatic compounds
- Long chain hydrocarbons,
- N and S containing heterosides.

ISOLATION METHODS :

- Distillation
- Extraction
- Mechanical method (Expression)

Distillation:

A. Water distillation

B. Water-Steam distillation

C. Steam distillation

Distillation:

Water distillation is used for the dried and heat resistant (boiling-resistant) compounds containing plant materials. Water-Steam distillation is used for the heat sensitive and deep tissue compounds containing plants. And Steam distillation is used for the fresh and surface-compounds containing plants. In distillation method, volatile oil is collected in burette of Clevenger equipment in laboratory scale or Florentin Tool in industrial scale. The type of these equipments is decided according to gravity of the volatile oil (heavy from the water or not).

Two methods have been developed for quantitative analysis of essential oils:

I) Volumetric Method

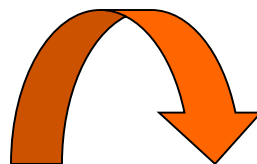
II) Gravimetric Method

VOLUMETRIC METHOD:

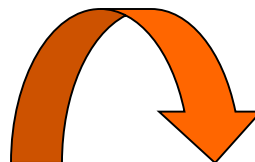
In distillation method, essential oil is collected in burette of Clevenger equipment in laboratory . The quantity of volatile oil is read from the burette as ml and recorded. The result should be given as v/w (ml/g).The density of the oil is measured with a pycnometer and the % w / w is calculated.

Experimental Procedure:

Sample + Water  **It is boiled for 2 hours.**
+ boiling stone (Until the amount of collected essential oil in the burette is constant.)



Collected essential oil is dried with anhydrous sodium sulphate (Na_2SO_4).



**The essential oils density is calculated with pycnometers and
% quantity of essential oil can be found as below.**

Quantitative Analysis of Essential Oils

Volumed specific-gravity bottle (pycnometer) is filled with water using burette and water volume of pycnometer can be found. Pycnometer's cap is closed properly = M1

Then 2 ml less than the first volume of water is put to the empty pycnometer and weighed absolutely again = M2

Then the volatile oil is added carefully to 2 ml water less pycnometer = M3

$M3 - M2 = 2 \text{ ml weight of essential oil}$

$M1 - M2 = 2 \text{ ml weight of water}$

$$d_{oil} = \frac{M3 - M2}{M1 - M2} = \frac{\text{oil}}{\text{water}}$$

P g sample

100

V x d g essential oil

X = % w/w

Volumetric methods give results within a short time and easier than gravimetric methods. Therefore new pharmacopeias accept the quantitative analysis method of volatile oil with volumetric method.